

**ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION  
AIR PERMITS PROGRAM**

**TECHNICAL ANALYSIS REPORT**  
for  
Air Quality Control Minor Permit No. AQ0271MSS01

BP Exploration (Alaska), Inc.  
Prudhoe Bay Seawater Treatment Plant

**MODIFY EQUIPMENT AND ADD NEW OWNER REQUESTED LIMIT**

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Prepared by: Jimmy N. Yap  
Supervisor: Sally A. Ryan, P.E.  
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## ABBREVIATIONS/ACRONYMS

AAC.....	Alaska Administrative Code
ACMP.....	Alaska Coastal Management Program
ADEC.....	Alaska Department of Environmental Conservation
AS.....	Alaska Statutes
ASTM.....	American Society of Testing and Materials
BAE.....	Baseline Actual Emissions
CEMS.....	Continuous Emission Monitoring System
C.F.R.....	Code of Federal Regulations
EPA.....	Environmental Protection Agency
MACT.....	Maximum Achievable Control Technology
NA.....	Not Applicable
NAICS.....	North American Industry Classification System
NESHAPS.....	National Emission Standards for Hazardous Air Pollutants
NSPS.....	New Source Performance Standards
ORL.....	Owner Requested Limit
PAE.....	Projected Actual Emissions
PS.....	Performance Specification
PSD.....	Prevention of Significant Deterioration
PTE.....	Potential to Emit
RM.....	Reference Method
SIC.....	Standard Industrial Classification
SN.....	Serial Number
TBD.....	To Be Determined

### Units and Measures

bhp.....	brake horsepower or boiler horsepower <sup>1</sup>
gr./dscf.....	grains per dry standard cubic feet (1 pound = 7,000 grains)
dscf.....	dry standard cubic foot
gph.....	gallons per hour
kW.....	kiloWatts
kW-e.....	kiloWatts electric <sup>2</sup>
lbs.....	pounds
mmBtu.....	million British thermal units
ppm.....	parts per million
ppmv.....	parts per million by volume
tph.....	tons per hour
tpy.....	tons per year
wt%.....	weight percent

### Pollutants

CO.....	Carbon Monoxide
HAPS.....	Hazardous Air Pollutants
H <sub>2</sub> S.....	Hydrogen Sulfide
NO <sub>x</sub> .....	Oxides of Nitrogen
NO <sub>2</sub> .....	Nitrogen Dioxide
NO.....	Nitric Oxide
PM-10.....	Particulate Matter with an aerodynamic diameter less than 10 microns
SO <sub>2</sub> .....	Sulfur Dioxide
VOC.....	Volatile Organic Compound

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<sup>1</sup> For boilers: One boiler horsepower = 33,472 Btu-fuel per horsepower-hour divided by the boiler's efficiency.  
For engines: approximately 7,000 Btu-fuel per brake horsepower-hour is required for an average diesel internal combustion engine.

<sup>2</sup> kW-e refers to rated generator electrical output rather than engine output

## **1.0 Introduction**

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Minor Source Air Quality Control Permit AQ0271MSS01 to BP Exploration (Alaska) Inc. (BPXA) for the Prudhoe Bay Seawater Treatment Plant (STP) under 18 AAC 50.508(5). BPXA's minor permit application is dated October 29, 2008.

### **1.1 Stationary Source Description**

BPXA Prudhoe Bay STP is an existing oil-and-gas production support facility owned by BPXA, ExxonMobil Corporation, ConocoPhillips Alaska, Inc., and Chevron USA Inc. BPXA operates the STP.

Water flood of an oil-producing reservoir maintains oil production rates and thereby increases the amount of recoverable oil from the field. The source of water for water flooding at the Greater Prudhoe Bay Unit (GPBU) is the STP. At the STP, seawater is pumped from the Beaufort Sea, strained and filtered, chlorinated, deaerated to remove oxygen, and then pumped to the GPBU Seawater Injection Plant. STP has the capacity to treat 2.2 million barrels of seawater per day.

The STP is a Prevention of Significant Deterioration (PSD) major stationary source as defined in 40 CFR 52.21(b)(1)(i)(b) (adopted by reference in 18 AAC 50.040) because it has the potential to emit more than 250 tons per year (tpy) of a regulated air pollutant in an area classified as attainment or unclassifiable.

### **1.2 Application Description**

BPXA is planning to refurbish four existing fuel-gas fired Lummus heaters (Emission Units 3, 4, 5 and 6), and two existing dual-fuel fired Lummus heaters (Emission Units 7 and 8). These heaters' primary function is to heat the seawater to allow for freeze protection between STP and the Seawater Injection Plant East. They also provide facility process heat.

Over time, the performance of this system of heaters has degraded as the heat exchange tubes in the convective section of the heaters have aged. The degradation has kept BPXA from operating the heaters at their rated capacity. In this application, BPXA proposes to refurbish the system to restore their heat transfer efficiency and to improve their operational rating as follows:

1. Tube replacement as required in the convective heat transfer section and radiant heat transfer sections of each heater;
2. Improvement of the combustion and control system on each heater; and
3. Possible reactivation of the flue gas recirculation (FGR) systems of each heater.

Various strategies exist to increase system performance; however, they generally include upgrades to the convective portions of some of the heaters, and potentially include replacing the burners in some of the heaters.

The increased emissions associated with the improved operational rating could trigger additional permitting requirements. The potential permit ramifications are described below. To avoid these ramifications, BPXA is proposing to de-rate the heaters and restrict their operation under an Owner Requested Limit (ORL).

BPXA will de-rate the STP Lummus heaters from a nominal rating of 120 MMBtu/hr heat absorbed to approximately 100 MMBtu/hr absorbed as part of the heater revamp project. BPXA indicated in the application that the expected operation of the Lummus heaters shall be five Lummus heaters in use at any given time with the sixth heater available on standby. BPXA used this as basis in the application (the equivalent of five heaters totaling approximately 500 MMBtu/hr heat absorbed operating 8,760 hours per year per heater) to estimate the projected annual emissions prior to implementation of an ORL.

The proposed upgrades to the Lummus heaters at STP constitute a physical change to an existing major stationary source.

### 1.3 Emissions Summary

The estimated changes in PTE and projected actual emissions for six Lummus Heaters are provided below in Table 1, along with the major permit applicability determination before and after implementation of the ORL.

**Table 1 – Emissions Summary and Permit Applicability, tpy**

<b>Pollutants</b>	<b>NO<sub>x</sub></b>	<b>CO</b>	<b>SO<sub>2</sub></b>	<b>PM-10</b>	<b>VOC</b>
Baseline Actual Emissions (BAE) <sup>a</sup>	111.8	34.9	6.3	10.5	7.6
Current PTE	366	276	67.2	33.8	24.5
PSD Permit Thresholds (tpy)	40	100	40	15	40
<b>Without ORL</b>					
New PTE without ORL	366	276	67.2	33.8	24.5
Projected Actual Emission (PAE)	210.9	65.9	11.9	19.8	14.2
Change using BAE vs. PAE	99.1	31.0	5.6	9.3	6.6
PSD permitting threshold exceeded?	Yes	No	No	No	No
<b>With ORL</b>					
New PTE with ORL	151	276 <sup>b</sup>	67.2 <sup>b</sup>	33.8 <sup>b</sup>	24.5 <sup>b</sup>
Projected Actual Emissions (PAE)	151.0	47.1	8.5	14.2	10.3
Change using BAE vs. PAE	39.2	12.3	2.2	3.7	2.7
PSD permitting threshold exceeded?	No	No	No	No	No

Table Notes:

<sup>a</sup> BPXA based BAE on the average rate, in tpy, from July 1, 2006 to June 30, 2008, as provided in Attachment II of the application.

<sup>b</sup>PTE for other pollutants remains the same after the project since these are unrestricted emissions and only NO<sub>x</sub> is being limited.

### **1.3.1 Permit Applicability for PSD Permitting under 18 AAC 50.306, 40 CFR 52.21 and 40 CFR 51.166**

BPXA has elected to use the “actual to projected actual applicability test” for projects that only involve existing emission units” as allowed under 40 CFR 52.21 (a)(2)(iv)(c) and 40 CFR 51.166(a)(1)(7)(iv)(c) to determine if a significant emissions increase would occur if an ORL were not established.

In calculating the projected actual emissions, BPXA used emission factors for NO<sub>x</sub> and CO based on source tests conducted in November 1997. BPXA projected that the increase in emissions for other criteria pollutants will be limited to the same 35% increase in NO<sub>x</sub> emissions (from 111.8 tpy to 151 tpy) that the ORL will allow for the six Lummus heaters.

BPXA compared the net change in emission due to the project to the PSD significant levels to determine if a PSD permit would be required without implementation of an ORL.

- Without an ORL, the project will trigger a PSD permit requirement due to the projected increase in actual NO<sub>x</sub> emissions from the Lummus Heaters after the upgrades as shown in Table 1. This is not the case for any other criteria pollutant, because the projected increases for all pollutants other than NO<sub>x</sub> are below the PSD significant levels.
- With the ORL, BPXA avoids triggering a PSD permit requirement.

Establishing an enforceable ORL for the six Lummus Heaters decreases the NO<sub>x</sub> PTE and sets the allowable increase in actual NO<sub>x</sub> emissions at less than the 40 tpy PSD significant emissions permitting threshold for the proposed heater re-vamp project. The 151 tpy NO<sub>x</sub> limit per consecutive 12-month period for all six Lummus Heaters (Emissions Units ID 3 through 8 in Minor Permit AQ0271MSS01) combined will also allow NO<sub>x</sub> emissions to increase above the baseline actual emissions by 39.2 tpy.

The ORL will also decrease projected actual emissions of all other criteria pollutants due to the indirect constraints the NO<sub>x</sub> potential combined emissions (151-tpy limit) will have on maximum potential operation of the six Lummus Heaters.

### **1.3.2 Assessable Emissions**

Emission fee requirements are required for each minor permit issued under 18 AAC 50.542, as described in 18 AAC 50.544(a). Assessable emissions for this project total 151 tpy as shown in **Table 2**. PTE for other pollutants remains the same before and after the project since these are unrestricted emissions. Therefore, the new assessable emissions for heaters and other units at the STP is 589.2 tpy. The new assessable emissions are included in Section 2 of Minor Permit AQ0271MSS01.

**Table 2 – PTE As Revised, tpy**

<b>POLLUTANT</b>	<b>NO<sub>x</sub></b>	<b>CO</b>	<b>SO<sub>2</sub></b>	<b>PM-10</b>	<b>VOC</b>	<b>Total Assessable Emissions</b>
<b>New PTE of Heaters with ORL</b>	<b>151</b>	<b>276</b>	<b>67.2</b>	<b>33.8</b>	<b>24.5</b>	<b>552.5</b>
<b>PTE of Other EUs with ORL</b>	<b>29.2</b>	<b>4.0</b>	<b>2.7</b>	<b>0.5</b>	<b>0.3</b>	<b>36.7</b>
<b>PTE for Assessable Emissions of All Units</b>	<b>180.2</b>	<b>280</b>	<b>69.9</b>	<b>34.3</b>	<b>24.8</b>	<b>589.2</b>

## **1.4 Department Findings**

Based on the review of the application, the Department finds that:

1. STP is an existing PSD major stationary source because it has a potential to emit more than 250 tpy of a regulated pollutant in an area classified as attainment or unclassifiable.
2. BPXA is currently operating STP under Operating Permit AQ0271TVP01.
3. Refurbishing the STP Lummus Heaters constitutes a physical change to an existing major stationary source under 18 AAC 50.306, 40 CFR 52.21 and 40 CFR 51.166.
4. BPXA used actual to projected actual emissions for comparing the project emissions to the PSD permitting thresholds in 18 AAC 50.306.
5. BPXA has requested an ORL to restrict the NO<sub>x</sub> emissions from the six Lummus heaters to 151 tpy.
6. When subject to the ORL of 151 tpy NO<sub>x</sub>, combined potential emissions for the six Lummus heaters and 39.2-tpy increase of NO<sub>x</sub> limit above BAE, the stationary source avoids triggering a PSD permit.
7. BPXA included proposed conditions with either Continuous Emission Monitoring System (CEMS) or Predictive Monitoring System (PEMS) in the application for this project. The Department finds that the CEMS part is acceptable, but the PEMS part is not (See discussion in 2.2.1.)
8. BPXA's application for a minor permit for STP contains the elements listed in 18 AAC 50.540.

## **2.0 Permit Requirements**

State regulations in 18 AAC 50.544 describe the elements that the Department must include in minor permits. This section of the TAR provides the technical and regulatory basis for the permit requirements in Minor Permit AQ0271MSS01, which is classified under 18 AAC 50.508(5).

### **2.1 General Requirements for all Minor Permits**

This permit includes the following requirements necessary for all minor permits as described in 18 AAC 50.544(a) (1) through (4):

- (1) The cover page identifies the stationary source, the project, the permittee, and contact information.



The Department includes emission fee requirements in minor permits if the minor permit changes assessable emissions. New assessable emissions are shown in Table 2 of this TAR

### **2.1.1 Assessable Emissions**

Emission fee requirements are required for each minor permit issued under 18 AAC 50.542, as described in 18 AAC 50.544(a). Assessable emissions for this project total 151 tpy as shown in Table 2. Therefore, the new assessable emissions for the STP are 589.2 tpy as included in Section 2 of Minor Permit AQ0271MSS01.

## **2.2 Requirements for a permit classified under 18 AAC 50.508(5).**

18 AAC 50.544(h) describes the requirements for a permit classified under 18 AAC 50.508(5). This permit describes terms and conditions, including specific testing, monitoring, recordkeeping, and reporting requirements; it lists the equipment covered by the ORL; it describes the classification that the limit allows the applicant to avoid.

### **2.2.1 Limit to Avoid Stationary Source PSD Major Modification Classification under 18 AAC 50.306**

The ORL limits the allowable increase in NO<sub>x</sub> emissions to 39.2 tpy using the BAE to PAE test as provided for in 40 C.F.R. 52.21(a)(2)(iv)(c)). This increase in NO<sub>x</sub> emissions will be less than the 40 tpy PSD significant emissions permitting threshold for the proposed modification of Lummus Heaters, therefore this project avoids Stationary Source PSD Major Modification Classification under 18 AAC 50.306.

BPXA proposed to use either CEMS or PEMS as methods in verifying compliance with the ORL for the STP. The CEMS conditions meet the requirements described in 18 AAC 50.255(b) (5), thus it is acceptable by the Department. The Department notified BPXA that the Permittee can demonstrate compliance with the ORL through CEMS.

With PEMS, a plan “subject to approval of the Administration (EPA) within 360 days of the initial start up of the heaters” cannot assure compliance with the limit. The Department received BPXA’s May 26, 2009 email with revised language for PEMS. The proposed language for PEMS includes additional conditions on the method of calculating NO<sub>x</sub> emissions, yet these conditions are still dependent on whether the plan will be approved by EPA or not. The proposed limit of 151 tpy NO<sub>x</sub> emissions for the heaters will cause 39.2-tpy increase NO<sub>x</sub> emission, with only small margin of not exceeding the PSD permitting threshold of 40 tpy NO<sub>x</sub>. Predicting NO<sub>x</sub> emissions through PEMS plan is certainly not a verifiable method for the STP.

Therefore, the only verifiable method to attain and maintain the NO<sub>x</sub> limits requested in BPXA's ORL for STP, can be achieved with a CEMS in place, not the prospective plan for PEMS. During the time that a plan will be submitted by BPXA to EPA for approval, there is no certainty that the limits set by the ORL will be complied upon. In the same manner, there is no guarantee that the plan for PEMS will be approved by EPA.

### **2.3 Certification and Information Requests**

All air quality control permits must contain procedures for information requests and certification, including certification requirements described in 18 AAC 50.544(h) (4). Information request requirements are specifically required under 18 AAC 50.200. Certification requirements are specifically required under 18 AAC 50.205.

### **2.4 Terms to Make Permit Enforceable**

The minor permit contains these requirements to ensure that the permittee will construct and operate the stationary source or modification in accordance with 18 AAC 50.

## **3.0 Permit Administration**

The Department intends to incorporate the terms and conditions of Minor Permit AQ0271MSS01 into the renewal of Operating Permit AQ0271TVP02. The Permittee may operate under Minor Permit AQ0271MSS01 upon issuance.